Smallpox Vaccine and Cancer

Some background on the smallpox vaccine

The vaccine's history

Smallpox is a highly contagious and sometimes fatal infectious disease. There is no treatment for smallpox, and the only way to prevent it is vaccination.

As many older adults may recall, smallpox vaccine was once given as a part of routine childhood immunizations. At that time, few cancer patients were vaccinated, and AIDS (acquired immunodeficiency syndrome) was unheard of. Smallpox vaccination in the United States was stopped in 1972 because there had been no reports of smallpox since 1949. Widespread immunization had caused the virus to be wiped out in the United States.

In the rest of the world, smallpox was done away with by 1977 through careful tracking of every case and vaccination of all possible contacts (people who had been exposed to the person with smallpox). At that time, experts believed that the only smallpox virus left in the world were lab samples in the former Soviet Union and the United States, and these were tightly guarded. But since September 2001, it's been thought that other countries or groups might have kept or gotten smallpox virus, and could use it as a weapon.

The vaccine today

The smallpox vaccine used today is called ACAM2000™. It's not available to the general public, although a smallpox outbreak would change that. As of early 2014, the only people who might get the vaccine are:

- Certain members of the US military
- Those selected by state public health preparedness programs
- People who work in labs that handle smallpox virus

In response to bioterrorism concerns, plans have been made to respond to a smallpox emergency. Enough smallpox vaccine has been stockpiled to vaccinate every person in the United States. If a smallpox outbreak occurs, public health officials will say who should get vaccinated at that time. If there is a smallpox outbreak, vaccinations may need to be repeated every 3 to 10 years.

Concerns about the vaccine

The vaccine against smallpox uses a live virus called *vaccinia*. It's not the smallpox virus, and you cannot get smallpox from the vaccine. The vaccinia virus rarely causes illness. The vaccine makes a person immune to the smallpox virus.

When children got the smallpox vaccine as part of their routine childhood immunizations, only a few became ill from it. Most of the children who did get sick already had skin problems such as burns, impetigo, or eczema. The vaccinia virus would infect these breaks in the skin, which led to serious infections in some children that in rare cases caused death.

Another group of children who had inherited diseases that caused weak immune systems also had trouble with the vaccine. These children were not able to produce an immune defense to the usually-mild vaccinia infection, and some became seriously ill and died.

Serious and sometimes fatal illnesses have also happened when children with undiagnosed leukemia or lymphoma were vaccinated.

Special concerns for people with weak immune systems

Because of the vaccine problems that have happened in the past, doctors are concerned about the way the smallpox vaccine could affect people with weakened immune systems if emergency vaccination were ever needed.

People with poor immune function are said to be *immunosuppressed*. This includes people with certain illnesses:

- Those with certain chronic diseases like liver disease, lupus, or other problems that affect the immune system
- Those who have had organ transplants, including stem cell or bone marrow transplants
- Those who take medicines that suppress the immune response (this is often called immunosuppressive therapy)
- Those with HIV infection or AIDS
- Most people with cancer – especially those being treated and those who have had bone marrow or peripheral blood cell transplants

Harm from the vaccine: People whose immune systems are not working well are most likely to have serious problems if they get the vaccine.

Getting the infection from someone who has gotten the vaccine: Even if they do not get the vaccine themselves, people with poor immune function can get vaccinia infection from vaccinated friends or family members.

A vaccinated person can shed virus from the vaccine site for up to 21 days after the vaccination. Vaccinia can be spread by touching a vaccination site before it has fully healed. It can also be spread by touching bandages, towels, washcloths, or clothes that have picked up live virus from the vaccination site. Vaccinia is NOT spread through the air.

There have been many reports of people who got a vaccinia infection from vaccinated people. Most of the time, these people already had skin problems such as eczema, sores, or broken skin. Touching something that had vaccinia virus on it allowed the virus to invade areas where the skin was open. Sometimes people became infected because of prolonged close contact with a person who was recently vaccinated. **Any person whose immune system is not working well should be careful to avoid contact with people vaccinated within the last 21 days.** (See the information under "What is 'close contact?'" in the section "Smallpox vaccine safety for people with cancer.")

Like other newly vaccinated people, health care workers can also transmit the vaccinia virus within 21 days of vaccination. But this should not be a problem, because these workers can cover their vaccination sites while at work. In some cases, they may be given time away from caring for certain patients; for instance, those with skin problems or immune deficiencies.

Larger problems may happen if the general public is vaccinated at some point in the future. People with poor immune function may find it hard to avoid being exposed to those who were recently vaccinated.

Smallpox vaccine safety for people with cancer

Should people with cancer avoid the vaccine?

Cancer itself, as well as many cancer treatments, suppress or weaken the immune system. Anyone with cancer whose immune system is not working well should not get a smallpox vaccination because of the increased risk of serious side effects. This means that any person with cancer should NOT get the vaccine unless a smallpox outbreak occurs and they have already been exposed to smallpox. And even in this case, they should talk to their cancer doctor before getting vaccinated.

What kinds of precautions should people with cancer take?

People with cancer should avoid close contact with people who recently have been vaccinated unless the vaccination site is covered with a gauze bandage and a special plastic dressing (called a semi-permeable dressing).

What is "close contact?"

The CDC defines close contact as household or similar intimate physical contact. This means that anyone who has had a smallpox vaccination should not live with, share a bed with, or share a bathroom with a person who has active cancer for at least 21 days after the vaccination.

Likewise, a person with cancer should not live with, or share a bed or bathroom with anyone who has had a smallpox vaccination within 21 days of their being vaccinated.

Because the vaccinia virus is passed through direct contact, it's not likely that a person will become infected at the workplace, in public places, or by using public transportation.

The main concern for people who have close, physical contact with someone who has been vaccinated is that the vaccinia virus can be spread from the vaccination site. Vaccinia is spread by touching a vaccination site before it has healed and then touching another part of the body or touching someone else. It can also be spread by touching bandages, clothing, towels, or other

material that picks up live virus from the vaccination site. The vaccination site often becomes itchy, which may lead to scratching, rubbing, or touching the site. This increases the risk that the virus will end up on other parts of the body, or on clothing and other surfaces.

How can a cancer patient know if they have been infected with vaccinia?

If a person with cancer gets a vaccinia infection, symptoms might include rash, fever, tiredness, and head and body aches. The rash starts in the mouth and then appears on the skin. Anyone who may have smallpox should see a doctor who specializes in infections (an infectious disease specialist) right away.

What if a person is exposed to the smallpox virus?

Smallpox is not transmitted by insects or animals. The chance of anyone being exposed to smallpox is very small, since the only known sources are isolated labs. Though there's no treatment, it is known that giving a person the vaccine even a short time after exposure (within 3 days) gives some protection against smallpox.

For some people with cancer, if they are actually exposed to smallpox, the risk of having smallpox may be higher than the risks linked to getting the vaccine. In the past, about 1 in 3 people with smallpox died, so the disease itself can be deadly. In cases like this, vaccinating after exposure can help.

Even so, there are some people who still may not be able to get vaccinated even if they have been exposed to smallpox. Anyone who has a reason to get the smallpox vaccine should first discuss the risks and benefits with a doctor.

You can find the CDC's information about smallpox, the vaccine, and their smallpox outbreak plan on their website at www.bt.cdc.gov/agent/smallpox/ or call them at 1-800-CDC-INFO (1-800-232-4636) or TTY 1-888-232-6348.

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For additional assistance please contact your American Cancer Society
1-800-227-2345 or www.cancer.org